

CLAIMS:

1 1. A method for identifying a data structure associated with a packet of data
2 comprising the steps of:

3 receiving a packet of data;

4 extracting one or more fields from a packet header of said packet of data to
5 generate a search key;

6 selecting a table to be accessed using said search key;

7 determining whether to identify said data structure associated with said packet
8 of data using a content addressable memory or a tree based on a table definition of
9 said selected table; and

10 identifying said data structure associated with said packet of data in response
11 to said determination step.

1 2. The method as recited in claim 1, wherein if said table definition of said
2 selected table determined to use said content addressable memory to identify said data
3 structure then the method further comprises the steps of:

4 transferring said search key to a tree search engine; and

5 associating said search key with a particular thread number/table number pair.

1 3. The method as recited in claim 2, wherein said search key is transferred to a
2 particular address in a first register in said tree search engine, wherein said particular
3 address in said first register is used to decode said particular thread number/table
4 number pair associated with said search key.

1 4. The method as recited in claim 3 further comprising the steps of:

2 transferring said search key from said tree search engine to one or more search
3 key registers in an interface unit, wherein said interface unit interfaces said tree
4 search engine and said content addressable memory.

1 5. The method as recited in claim 4 further comprising the step of:

2 transferring said particular address used to decode said particular thread
3 number/table number pair associated with said search key to a second register in said
4 interface unit.

1 6. The method as recited in claim 4 further comprising the step of:

2 transferring said search key from one of said one or more search key registers
3 to said content addressable memory.

1 7. The method as recited in claim 6 further comprising the steps of:

2 identifying a particular entry number in said content addressable memory
3 based on said search key; and

4 identifying said data structure associated with said packet of data in a data
5 structure memory based on said particular entry number in said content addressable
6 memory.

1 8. The method as recited in claim 6 further comprising the step of:

2 determining whether said search key matches a particular entry in said content
3 addressable memory.

1 9. The method as recited in claim 8, wherein if said search key matches said
2 particular entry in said content addressable memory then said content addressable
3 memory returns a particular entry number.

1 10. The method as recited in claim 9 further comprising the steps of:

2 shifting said particular entry number;

3 adding said particular entry number to a base address, wherein said base
4 address comprises a starting address of said data structure memory;

5 storing a result of said particular entry number added to said base address in a
6 result register; and

7 reading said result in said result register, wherein said result is indexed in said
8 result register based on said particular thread number/table number pair associated
9 with said search key.

1 11. The method as recited in claim 10, wherein said result is a pointer used to
2 index into an appropriate entry in said data structure memory to identify said data
3 structure associated with said packet of data.

1 12. The method as recited in claim 1 further comprising the step of:
2 performing a particular action on said packet of data based on said data
3 structure identified in said data structure memory.

1 13. The method as recited in claim 10, wherein said result in said result register is
2 a pointer in a same format when said tree is used to identify said data structure
3 associated with said packet of data.

1 14. The method as recited in claim 5, wherein said one or more search key
2 registers and said second register in said interface unit are organized in a pipeline
3 manner, wherein said search key is associated with one or more thread number/table
4 number pairs.

1 15. A packet processor comprising:
2 an internal processor, wherein said internal processor comprises circuitry for:
3 receiving a packet of data;
4 extracting one or more fields from a packet header of said packet of
5 data to generate a search key;
6 selecting a table to be accessed using said search key; and
7 determining whether to identify a data structure associated with said
8 packet of data using a content addressable memory or a tree based on a table
9 definition of said selected table;
10 a tree search engine coupled to said internal processor;
11 a data structure memory coupled to said tree search engine, wherein said data
12 structure memory comprises a plurality of data structures, wherein said data structure
13 of said plurality of data structures comprises data relating to specific actions said
14 internal processor is to perform on said packet of data; and
15 said content addressable memory coupled to said tree search engine via an
16 interface unit, wherein said content addressable memory stores a plurality of entries,
17 wherein each of said plurality of entries has an entry number associated with it; and
18 wherein said tree search engine comprises circuitry for:
19 identifying said data structure associated with said packet of data in
20 response to said internal processor determining whether to identify said data structure
21 associated with said packet of data using said content addressable memory or said
22 tree based on said table definition of said selected table.

1 16. The system as recited in claim 15, wherein said internal processor further
2 comprises circuitry for:
3 transferring said search key to a tree search engine; and
4 associating said search key with a particular thread number/table number pair.

1 17. The system as recited in claim 16, wherein said search key is transferred to a
2 particular address in a first register in said tree search engine, wherein said particular
3 address in said first register is used to decode said particular thread number/table
4 number pair associated with said search key.

1 18. The system as recited in claim 17, wherein said tree search engine further
2 comprises circuitry for:

3 transferring said search key from said tree search engine to one or more search
4 key registers in said interface unit, wherein said interface unit interfaces said tree
5 search engine and said content addressable memory.

1 19. The system as recited in claim 18, wherein said tree search engine further
2 comprises circuitry for:

3 transferring said particular address used to decode said particular thread
4 number/table number pair associated with said search key to a second register in said
5 interface unit.

1 20. The system as recited in claim 18, wherein said interface unit comprises
2 circuitry for:

3 transferring said search key from one of said one or more search key registers
4 to said content addressable memory.

1 21. The system as recited in claim 20, wherein said content addressable memory
2 comprises circuitry for:

3 identifying a particular entry number in said content addressable memory
4 based on said search key.

1 22. The system as recited in claim 21, wherein said tree search engine further
2 comprises circuitry for:

3 identifying said data structure associated with said packet of data in said data
4 structure memory based on said particular entry number in said content addressable
5 memory. The system as recited in claim 20, wherein said interface unit further
6 comprises circuitry for:

7 determining whether said search key matches a particular entry in said content
8 addressable memory.

1 23. The system as recited in claim 23, wherein if said search key matches said
2 particular entry in said content addressable memory then said content addressable
3 memory returns a particular entry number.

1 24. The system as recited in claim 24, wherein said interface unit further
2 comprises circuitry for:

3 shifting said particular entry number;
4 adding said particular entry number to a base address, wherein said base
5 address comprises a starting address of said data structure memory;
6 storing a result of said particular entry number added to said base address in a
7 result register; and

8 reading said result in said result register, wherein said result is indexed in said
9 result register based on said particular thread number/table number pair associated
10 with said search key.

1 25. The system as recited in claim 25, wherein said result is a pointer used to
2 index into an appropriate entry in said data structure memory to identify said data
3 structure associated with said packet of data.

1 26. The system as recited in claim 15, wherein said internal processor further
2 comprises circuitry for:

3 performing a particular action on said packet of data based on said data
4 structure identified in said data structure memory.

1 27. The system as recited in claim 25, wherein said result in said result register is
2 a pointer in a same format when said tree is used to identify said data structure
3 associated with said packet of data.

1 28. The system as recited in claim 19, wherein said one or more search key
2 registers and said second register in said interface unit are organized in a pipeline
3 manner, wherein said search key is associated with one or more thread number/table
4 number pairs.

1 29. A method for identifying a data structure associated with a packet of data
2 comprising the steps of:

3 receiving a packet of data;

4 extracting one or more fields from a packet header of said packet of data to
5 generate a search key;

6 transferring said search key to a content addressable memory by a tree search
7 engine configured to identify said data structure associated with said packet of data;

8 identifying a particular entry number in said content addressable memory
9 based on said search key; and

10 identifying said data structure associated with said packet of data based on
11 said particular entry number in said content addressable memory.

1 30. The method as recited in claim 29, wherein if said search key matches a
2 particular entry in said content addressable memory then said content addressable
3 memory returns said particular entry number.

1 31. The method as recited in claim 29, wherein if said search key does not
2 matches a particular entry in said content addressable memory then said content
3 addressable memory returns a null pointer.

1 32. The method as recited in claim 29 further comprising the step of:
2 performing a search in said content addressable memory using said search
3 key; and
4 determining whether said search in said content addressable memory is
5 complete.

- 1 33. The method as recited in claim 32, wherein if said search in said content
2 addressable memory is not complete then the method further comprises the step of:
3 loading a register with a pointer, wherein said pointer points to said register.

1 34. A packet processor comprising:
2 an internal processor, wherein said internal processor comprises circuitry for:
3 receiving a packet of data; and
4 extracting one or more fields from a packet header of said packet of
5 data to generate a search key;
6 a tree search engine coupled to said internal processor, wherein said tree
7 search engine comprises circuitry for:
8 transferring said search key to a content addressable memory;
9 a data structure memory coupled to said tree search engine, wherein said data
10 structure memory comprises a plurality of data structures, wherein a data structure of
11 said plurality of data structures is associated with said packet of data, wherein said
12 data structure comprises data relating to specific actions said internal processor is to
13 perform on said packet of data; and
14 said content addressable memory coupled to said tree search engine via an
15 interface unit, wherein said content addressable memory stores a plurality of entries,
16 wherein each of said plurality of entries has an entry number associated with it,
17 wherein said content addressable memory comprises circuitry for:
18 identifying a particular entry number in said content addressable
19 memory based on said search key; and
20 wherein said tree search engine further comprises circuitry for:
21 identifying said data structure associated with said packet of data
22 based on said particular entry number in said content addressable memory.

1 35. The system as recited in claim 34, wherein if said search key matches a
2 particular entry in said content addressable memory then said content addressable
3 memory returns said particular entry number.

1 36. The system as recited in claim 34, wherein if said search key does not matches
2 a particular entry in said content addressable memory then said content addressable
3 memory returns a null pointer.

1 37. The system as recited in claim 36, wherein said content addressable memory
2 further comprises circuitry for:
3 performing a search in said content addressable memory using said search
4 key; and
5 determining whether said search in said content addressable memory is
6 complete.

1 38. The system as recited in claim 34, wherein if said search in said content
2 addressable memory is not complete then the said interface unit comprises circuitry
3 for:
4 loading a register with a pointer, wherein said pointer points to said register.